

## BRE Global Test Report

**Fire tests to Annex C of BS 8458 with a Prevent low pressure water mist system incorporating Prev5exp20 nozzles**

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## 1 Introduction

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BRE Global was requested by Prevent Systems to undertake a series of test fires to Annex C of BS 8458 'Fixed fire protection systems – Residential and domestic watermist systems – Code of practice for design and installation', 2015<sup>1</sup>. Annex C (normative) is titled 'Room fire tests for watermist systems with automatic nozzles'.

The series was conducted with a low pressure automatic water mist system provided by:

Prevent Systems AS

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This report summarises the findings from the test programme carried out and assesses the results against the recommendations given for water mist system fire performance in Clause 6.1 of BS 8458.

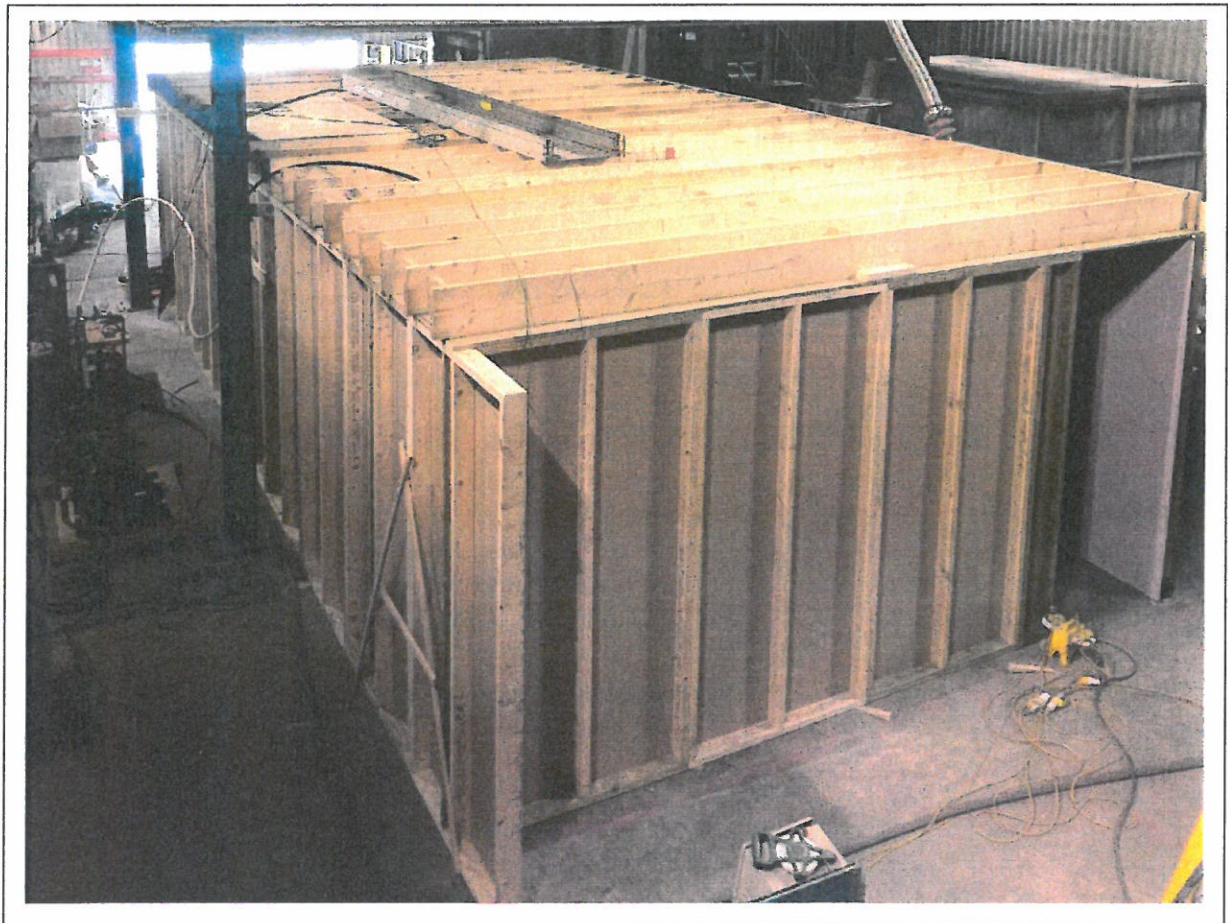




## 2 Test programme

### 2.1 Fire room

The fire room is shown in Figure 1.



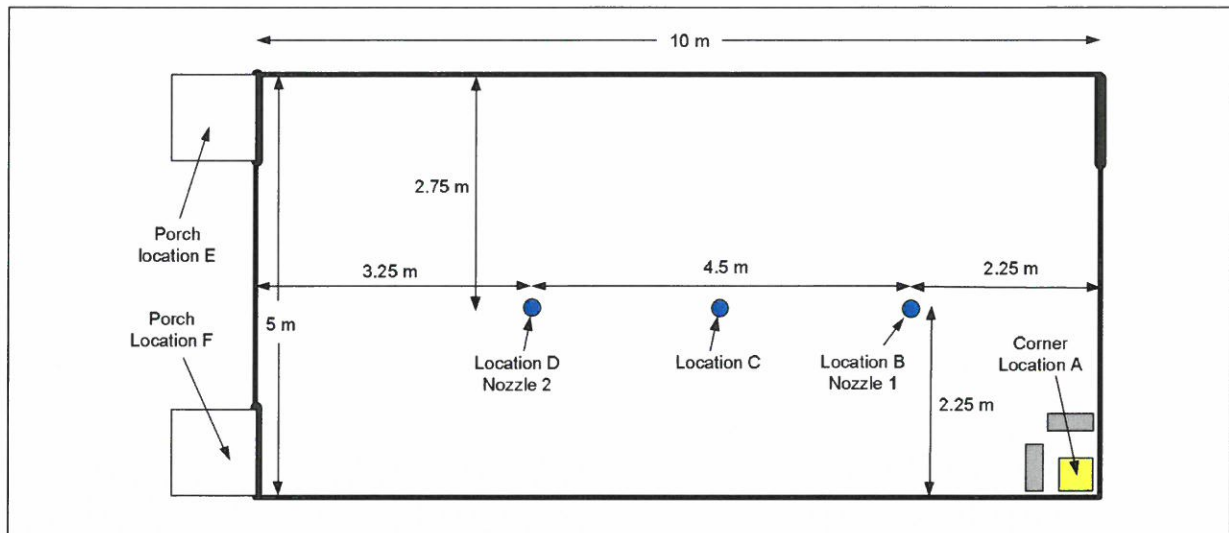
**Figure 1 – Room**

The room was constructed using 12 mm type F fire-rated plasterboard attached to a lightweight timber frame. The compartment measured 10 m long and 5 m wide with an internal ceiling height of 2.5 m.



### 2.1.1 Instrumentation

A plan view schematic of the room is shown in Figure 2.



**Figure 2 – Schematic plan view drawing of the fire room**

With reference to Figure 2 above, the following instrumentation was installed as detailed in Table 1.

Location	Instrumentation
Location A, directly above the centre of the wood crib.	1.5 mm type k thermocouples at heights above the floor of 500 mm and 2425 mm (75 mm below the ceiling).
Location B.	1.5 mm type k thermocouples at heights above the floor of 1600 mm and 2425 mm (75 mm below the ceiling).
Location C.	1.5 mm type k thermocouples at heights above the floor of 1600 mm and 2425 mm (75 mm below the ceiling).
Location D.	1.5 mm type k thermocouples at heights above the floor of 1600 mm and 2425 mm (75 mm below the ceiling).
Location E (also for door opening position 2 Location F), porch.	1.5 mm type k thermocouple at height above the floor of 2425 mm (75 mm below the ceiling).
Pipework	1½" Barton turbine flow meter, 0 – 280 l/min. Druck PMP pressure transducer, 0 – 16 bar.

**Table 1 – Summary of installed instrumentation**

A Graphtec GL800 data logger was used for data acquisition at a sampling rate of 1 Hz.





## 2.2 Ignition and fuel packages

The ignition and fuel package for each test was as specified in BS 8458; the arrangement for the first test is shown in Figure 3.

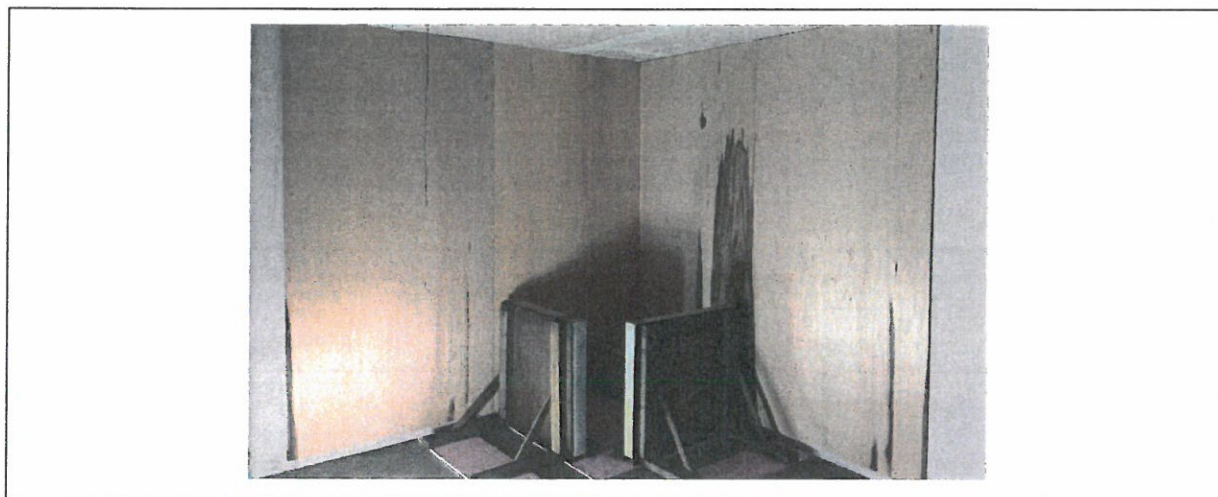


Figure 3 – Ignition and fuel package

## 2.3 Prevent's low pressure water mist system

Prevent installed their automatically operating low pressure water mist system for the work programme.






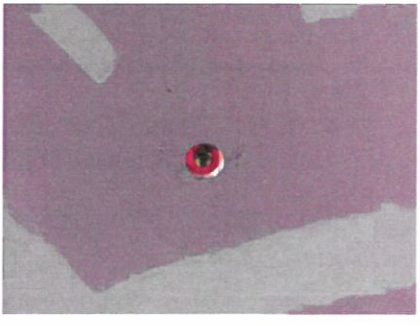
### 2.3.1 Equipment

The system components included:

- An electrical 3 phase 415 V pump set manufactured by Grundfos; Grundfos Fire RS booster set (designed by Grundfos specifically for Prevent Systems);
- Flexible pipe connection from pump outlet to manifold - Georg Fisher JRG Ltd, JRG Sanipex MT pipe in coils, multilayer pipe, (PE-X/AL/PE-X) according DVGW W542 and EN ISO 21003, inner pex pipe (white) and outer pex coating (white) made of cross linked polyethylene (PE-X), support pipe in aluminium, butt welded, for drinking water 70°C/10 bar, heating max. 95°C and compressed air installations 40°C/15 bar (dry and oil free);
- Manifold – Georg Fisher JRG Ltd distributor 3-way – made of gunmetal, with loose nut, gasket, male thread and cone grip unions;
- Pipe-in-pipe – Georg Fisher JRG Ltd, conduit PE black, in coils, made of polyethylene, black, to fit: JRG Sanipex pipe 5707, 5708, 5717, 5718, JRG Sanipex MT pipe 4602;
- Nozzle housing - Georg Fisher JRG Ltd, JRG Sanipex box 90° with extension – Box body in two parts and extension made in plastic, with flexible foot, gunmetal bend, with female thread and cone grip union.

BRE Global provided a water supply at a nominal 5 bar pressure to the Grundfos pump unit. Photographs of system components are shown in Figure 4. Further information on system components was submitted to BRE Global by Prevent (some further information is included in Appendix A).



	
<p>Pump unit</p>	<p>Electrical control box for pump unit</p>
	
<p>Flexible pipe connecting pump outlet to manifold</p>	<p>Flexible pipe (white) to manifold and manifold to flexible pipe-in-pipe (black) connection</p>
	
<p>Pipe-in-pipe connection to nozzle housing</p>	<p>Nozzle housing penetration in test room ceiling</p>

**Figure 4 – Prevent water mist system components**

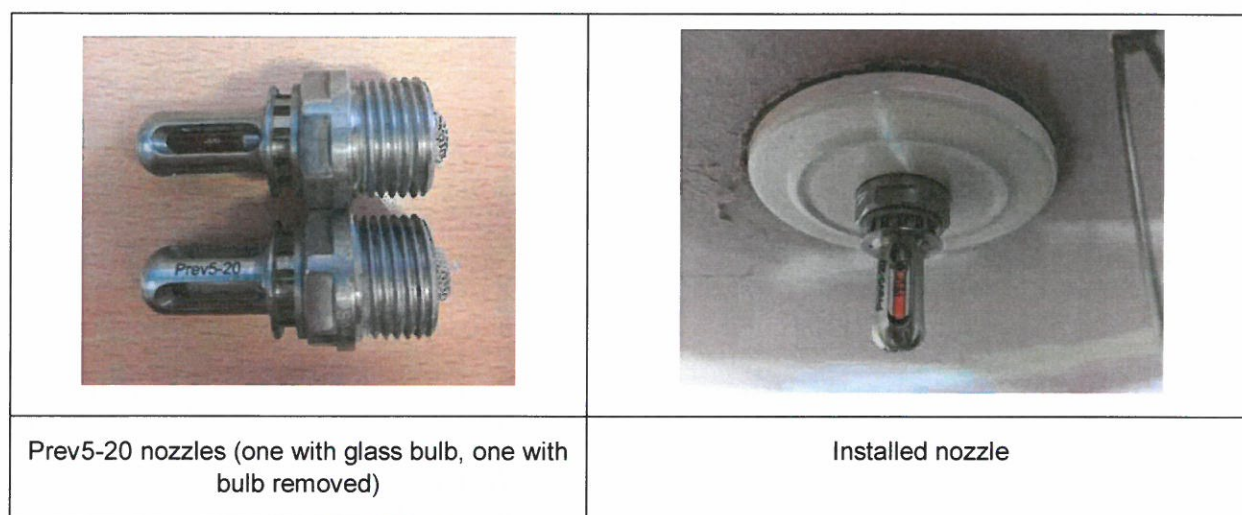




The Prevent pipe system was coupled to a BRE Global water supply flow meter and a BRE Global pressure transducer was installed at ceiling level close to Nozzle 1 (see Figure 2).

### 2.3.2 Nozzles

Nozzles used in the test programme are shown in Figure 5. The nozzle was designated Prev5exp20 by Prevent. A datasheet for the nozzle was supplied to BRE Global by Prevent and is included in Appendix B.



**Figure 5 – Prevent Prev5exp20 nozzle**

Prevent stated that the minimum design pressure at the nozzle was 2.2 bar.

The nozzles used during the test programme were determined to have a nominal k-factor of 29.

## 2.4 Procedure

The fuel and ignition packages were prepared and arranged in accordance with the specification provided in BS 8458 Annex C.

The heptane in the steel tray below the wood crib was ignited with the heptane soaked cotton wicks. The thermocouples, pressure transducer and flow measurements were recorded for a minimum period of 30 minutes after the operation of the water mist system.

The laboratory, nominal dimensions 40 m x 15 m x 15 m high, had a mechanical ventilation system running for each test with high level extraction at an initial rate of 30 m<sup>3</sup>/sec. Tests were carried out in ambient laboratory conditions with additional heating provided in the test room, if required.

Before each test, the water supply to the pump was set at a nominal 5 bar pressure by BRE Global. The system was activated by the operation of a frangible bulb fitted in a nozzle in response to the heat generated in the test fire. The water mist system was manually terminated 30 minutes after the first head activation in each test.



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## 4 Conclusion

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The Prevent water mist system submitted to BRE Global for testing and as described in section 2.3 of this report met the recommendations of Clause 6.1 of BS 8458: 2015 when tested in accordance with Annex C, Clauses C.1 to C.4.